

International Miningengineer

November 2017

www.engineerlive.com

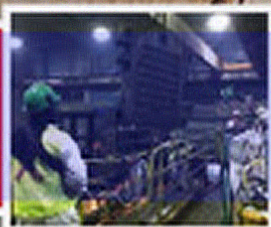
EYE in the SKY

Drones deliver data

NEW
drill rig
design

Safer
HAUL TRUCKS

Upgrading
CONVEYOR
TECHNOLOGY



Mining makeover
Equipment upgrade
programme reaps
rewards at Chilean site



Payload monitoring
Introducing a smart new
solution designed to improve
fleet productivity



International Miningengineer

www.engineerlive.com

NOVEMBER
2017

INDUSTRY NEWS 6

A selection of the latest mining product, service and project news

SPECIAL FOCUS: DRONES 8

Drones take off
Reporting on the fast-growing adoption of UAVs for use in a variety of mining applications

Drones head underground 14

3D laser scanning and mapping of underground mine cavities with aerial drones

DRILL & BLAST 17

Redefining the drill rig
Could a new design of drill rig provide a revolution in Australian mining?

LOAD & HAUL 19

Making haul trucks safer
A new vehicle intervention system is designed to lead to safer mines



20 Smart, shovel-based solution

How an innovative new payload monitoring system can help to improve fleet productivity

22 Coping with demand for copper

Rigid haulers are improving operations at a Romanian copper mine

24 SPECIALIST EQUIPMENT

Makeover for mine equipment

By devising a comprehensive upgrade programme, a Chilean mine has improved the availability of its VPA filter by 15%

26 Containment strategy

Silver mine controls dust and spillage using modern conveyor technology

30 Advances in materials handling

Re-engineering transfer points to remove the maintenance headache

32 Advancing wear resistance

Not all wear solutions are created equal so it pays to take some expert advice

PUBLISHER David Washington

EDITOR Louise Smyth

+44 (0)207 454 7177

CONTRIBUTING EDITOR Jon Lewson

STUDIO Gill Harris

PRODUCTION DIRECTOR Christine Flaxman

+44 (0)207 454 7185

PRODUCTION CO-ORDINATOR Lucy Gilroy

+44 (0)207 454 7186

BUSINESS MANAGER John Abey +44 (0)207 454 7176

SETFORM

Setform's International magazine for engineers is published monthly and distributed to senior engineers throughout the world. Its core contributors on Mining Engineering. Other topics focus on Oil & Gas, Design, Process, Buildings and Power.

www.engineerlive.com

The publishers do not sponsor or otherwise support any substance or service advertised or mentioned in this book. It is the publisher's responsibility for the accuracy of any statement in this publication. ©2017. The entire content of this publication is protected by copyright, full details of which are available from the publishers. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior permission of the copyright owner.



8

Report on the burgeoning use of unmanned aerial vehicles (UAVs) for a variety of mining applications

CONTAINMENT

strategy

Silver mine controls dust and spillage using modern conveyor technology

One of the leading experts in the design and manufacture of conveyor components has helped the largest primary silver producer in North America to mitigate fugitive material and increase safety by upgrading the company's bulk handling system.

Coeur Mining was experiencing excessive dust and spillage on the conveyor leading from the crusher to the surge pile, which lowered air quality, required five to 10 man-hours per day to clean, and caused unscheduled downtime from premature equipment failure. Therefore Martin Engineering

installed a transfer point load zone using Evo Conveyor Architecture that contains dust and spillage by centering and controlling cargo, resulting in reduced maintenance, improved workplace safety and a lower cost of operation.

Coeur Rochester, located in Pershing County, Nevada, produced an estimated yield of 5.0 million ounces of silver and more than 50,000 ounces of gold in 2015. The massive site is spread over 10,800 acres (43.7km²), and includes a network of 20 conveyors, originally designed and installed in 1986. Given the system's age and the amount of usage over nearly 30 years in service, company officials wanted to find ways to update the conveyors with the most advanced technology to raise efficiency, reduce dust and spillage, and contribute to improved safety.

Where to start

Conveyor B was chosen as the starting point with the most potential for improvement, a 48in wide belt running at 386 fpm, with a 40ft chute wall. With a troughing angle of 35°, Conveyor B handles nearly 1,500 TPH of rock that has been sized to less than 4in, carrying it from the secondary cone crusher to the surge pile stacker. It's loaded directly by a vibrating grizzly feeder under the chute and the secondary crusher.

"There's a long fall going to the secondary crusher, and that creates a huge disturbance in the material flow," explains crusher operations/fixed plant maintenance superintendent, Wayne Maita. "We were seeing a lot of dust and spillage in that area. It not only affected the air quality and presented a potential safety risk from accumulated material on floors and structures, but it also meant putting operational

Coeur Rochester produced 4.2 million ounces of silver in 2014, along with 44,888 ounces of gold

personnel in close proximity to the moving conveyor for clean-up."

Coeur also noticed belt damage occurring as a result of fugitive material. "As material escapes, it accumulates on idlers and other components, often creating friction points that contribute to excessive wear and premature failure," comments Martin Engineering product engineer, Daniel Marshall. "That can have immediate costs such as belt replacement and seized bearings. And once an idler freezes, the constant belt movement can wear through the shell with surprising speed."

Coeur managers initiated discussions with Hardrok Equipment – a licensed dealer of Martin Engineering equipment – revolving around the Evo Conveyor Architecture. "With proper design, premium components should improve productivity and safety, and that greater efficiency delivers a lower total cost of ownership," observes Hardrok president, Ted Zebroski.



The primary seal is clamped to the steel skirtboard and a secondary 'outrigger' strip captures the fines



The modular chute wall allows easy installation of skirt boards and stilling zone components to manage dust

To maintain a straight and consistent belt path, technicians then installed a Heavy-Duty Tracker Belt Tracking System

Installing a solution

A team of eight technicians from Hardrok and two Martin supervisors began work during a scheduled outage. Over a seven-day period, five Martin Evo Combination Cradles were installed to absorb the impact of the falling load, while minimising friction and belt wear. Steel-reinforced impact bars and adjustable wing supports matched standard trough angles of 20°, 35° or 45°. The Combination Cradle replaces the centre bars with an impact idler roll, a design that delivers a flat surface for an effective edge seal, but minimises the friction of having sliding bars all the way across.

Five Evo Slider Cradles with low-friction bars were also installed to support the belt edges and stabilise the belt line, eliminating belt sag and bounce. Located in the chute box after the impact cradles, the units' "double-life" slider bars offer a superior seal with low friction and enable each bar to be flipped over at the end of its useful life to provide a second wear surface. The result is a flat and stable belt surface throughout the settling zone, reducing fugitive material and extending belt health. Both cradle designs feature Martin Engineering's Trac-Mount technology, allowing the units to slide in and out easily for maintenance or replacement.

40ft of modular chute wall replaced the old structure, with a tail box and integrated dust curtains. A chromium carbide overlay on the inside of the chute protects the new containment system from intermittent high-burden depths on the conveyor. The chute is raised 4in above the belt and fitted



Dust and spillage created a maintenance burden and potential safety hazard

with an external wear liner. Using this approach, the material still hits the liner and doesn't damage the chute. The result is considerably reduced installation and service time, with reduced risk during service.

At the bottom of the wear liner installers mounted 84 linear ft of ApronSeal Double Skirting, which delivers two wear surfaces on a single elastomer sealing strip. When the bottom side of the strip against the belt is worn, the sealing strip is inverted, providing a second service life.

To maintain a straight and consistent belt path, technicians then installed a Heavy-Duty Tracker Belt Tracking System, both upper and lower units. Using innovative multiple-pivot, torque-multiplying technology, the tracker detects slight misalignments and uses the force of the belt to automatically position a steering idler in the opposite direction of the misalignment.

To address belt carryback and further reduce the chance of fugitive material, a dual belt cleaner system was mounted on the face of the head

pulley. The QC1 Cleaner XHD primary cleaner is engineered to deliver durable belt scraper performance in challenging applications, high belt speeds and multiple splices. Directly after the primary cleaner is a DT2 Inline Cleaner XHD, a secondary conveyor belt scraper featuring rugged blades installed on a track that slides into position on a rigid steel mandrel, which allows quick blade replacement.

A final belt protection mechanism was installed at the tail pulley to fight the damaging effects of fugitive material on the return side of the belt. The Torsion V-Plow features a spring-loaded suspension system that allows the plough to rise and fall with fluctuations in belt tension and travel, sweeping away any fugitive material before it can reach the pulley.

To complete the containment system, technicians also installed an integrated air cleaner, which contains a suction blower, filtering elements and a filter cleaning system. Instead of a centrally located unit connected

to dust generation points via ductwork, the Martin Air Cleaner is incorporated into the dust generation point itself. The particles are not extracted, but are instead collected within the enclosure and periodically discharged back into the material stream.

Impressive results

The results were immediately apparent. "We've gone from an everyday battle with this conveyor to almost no clean-up at all," says a delighted Maita. "Now we have a guy go down there with a broom every few days. That's it."

Cocur Rochester is currently evaluating five additional conveyor areas for its next upgrade, with a plan currently under development to address those locations. "We're extremely happy with the system," Maita concludes. "The installation was well done, and the guys were very professional and safety-conscious. It's changed a nightmare into an extremely functional system that operates at a high level." •